

Preliminary Report for Class Certification

for

**OTTO E. THORNBURG, on behalf of themselves and all others similarly situated,
Plaintiffs, v. FORD MOTOR COMPANY, Defendant.**

**United States District Court for the Western District of Missouri Western Division
Case No. 4:19-cv-01025-HFS**

Prepared for:

Liddle Sheets Coulson P.C.
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Prepared by:

A handwritten signature in black ink, appearing to read "Mark P. Cal".

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January 4, 2022

Executive Summary

The law firm of Liddle Sheets Coulson P.C. has retained Dr. Mark P. Cal, P.E., BCEE to investigate the appropriateness of using atmospheric dispersion modeling, and more specifically, AERMOD, to analyze the impacts of nuisance odors on the community near the Ford Kansas City Assembly Plant (“Ford Claycomo”) located at 8121 US Highway 69 in the Village of Claycomo, Clay County, Missouri 64119 [1].

Atmospheric dispersion models, e.g. AERMOD, use computational simulations to model physical and statistical processes that affect the transport of air pollutants (particles and gases) and odors. Atmospheric dispersion models are a key regulatory tool used by all local, state and federal regulatory agencies in the air permitting process and also have non-regulatory uses. They are used to determine local impacts of air pollutant emissions, the effects of combined sources (source contribution), dispersion of nuisance odors and to assist in the design of effective air pollution control strategies. They can also be used to determine the magnitude and frequency of odor impacts from individual sources or the total impact from multiple sources. Models can also be used to quantify human exposure to air pollutants from nearby sources.

Based on a review of documentation provided by the plaintiff’s counsel, Liddle Sheets Coulson P.C. [1-5], technical literature, and Dr. Cal’s 34-years of experience in air quality engineering, Dr. Cal has the following conclusions and opinions:

1. The Ford Claycomo facility produces the F-150 truck and the Transit van. Also located at this facility is an industrial vehicle painting facility. The vehicle painting facility uses robotic sprayers in paint booths to coat the vehicles. Once the vehicles have been painted and clear-coated, they are cured in a paint oven and allowed to dry. The paint and clear-coat used is solvent-based and contains a substantial percentages of volatile organic compounds (VOCs), which will evaporate during the painting, curing and drying processes [1,4,5].
2. Residents living within a 2-mile radius of the facility have described nuisance odors using terms, such as paint, varnish, acetone, chemical, petroleum. Residents noted that, when nuisance odors were present, they tried to stay inside and would not open doors or windows to their home. Residents stated that the nuisance odors gave them headaches, itchy eyes, and affected their breathing [2,3]. These descriptions are consistent with strong nuisance odors emanating from an improperly maintained facility. Due to the excessive number of citizen complaints, the facility is not being appropriately managed to minimize nuisance odors leaving the facility boundary.
3. According to the air permit issues by the Missouri Department of Natural Resources, the facility has the potential to emit up to 2,363 tons per year of VOCs. Actual 2016 VOC emissions were noted to be 1,885 tons per year [4]. VOC Constituents of the paint and clear-coat are known to have significant odor intensities [5]. If these VOCs are not captured or destroyed before being vented to the atmosphere, they will become airborne. Once airborne, nuisance odors present in the VOC mixture will be transported to neighboring areas dependent upon local meteorology.
4. AERMOD is the preferred atmospheric dispersion model used by local, state and federal regulatory agencies and in non-regulatory situations, e.g. modeling of odor dispersion. The maximum effective range for AERMOD is 31-miles (50-km), which is within the 2-

mile radius class area impacted by nuisance level odors emitted from the Ford Claycomo facility.

5. Atmospheric dispersion of odorous compounds from the Ford Claycomo facility can be modeled using data obtained from publicly available sources, including the air quality permit, facility air emissions testing, estimated emissions factors, local meteorological data and terrain data.
6. A detailed atmospheric dispersion modeling analysis centered around the Ford Claycomo facility can determine the frequency, intensity and location of nuisance odors within the class area. This would allow for a determination of which residential properties within the class area are impacted by Ford Claycomo's emissions and to what extent.

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1.0 Introduction

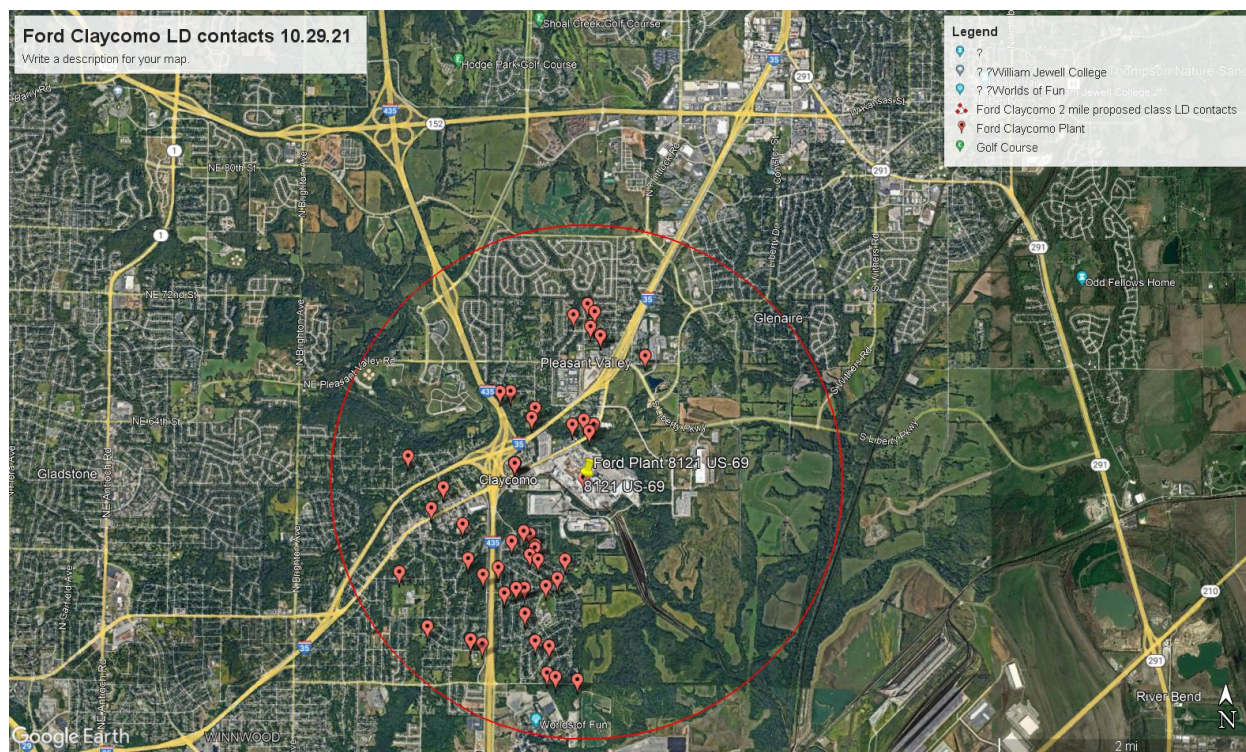
The law firm of Liddle Sheets Coulson P.C. has retained Dr. Mark P. Cal, P.E., BCEE to investigate the appropriateness of using atmospheric dispersion modeling, and more specifically, AERMOD, to analyze the impacts of nuisance odors on the community near the Ford Kansas City Assembly Plant (“Ford Claycomo”) located at 8121 US Highway 69 in the Village of Claycomo, Clay County, Missouri 64119 [1].

2.0 Ford Claycomo Assembly Plant Operational Characteristics and Odor Complaints

The Ford Kansas City Assembly Plant (“Ford Claycomo”) located at 8121 US Highway 69 in the Village of Claycomo, Clay County, Missouri 64119 resides on a 1,269-acre site surrounded by residential properties. At this location, Ford produces the the F-150 truck and the Transit van. Also located at this facility is an industrial vehicle painting facility. The vehicle painting facility uses robotic sprayers in paint booths to coat the vehicles. Once the vehicles have been painted and clear-coated, they are cured in a paint oven and allowed to dry. The paint and clear-coat used is solvent based and contains a substantial percentages of volatile organic compounds (VOCs), which will evaporate during the painting, curing and drying process. According to the air permit issued by the Missouri Department of Natural Resources, the facility has the potential to emit up to 2,363 tons per year of VOCs. Actual 2016 VOC emissions were noted to be 1,885 tons per year [4]. Constituents of the paint (VOCs) are known to have significant odor intensities [5]. If these VOCs are not captured or destroyed before being vented to the atmosphere, they will become airborne. Once airborne, nuisance odors will be transported to neighboring areas dependent upon local meteorology.

Residents living within a 2-mile radius of the facility have described nuisance odors using terms, such as paint, varnish, acetone, chemical, petroleum. Residents noted that, when noxious odors were present, they tried to stay inside and would not open doors or windows to their home. Residents stated that the nuisance odors gave them headaches, itchy eyes, and affected their breathing [2,3]. These descriptions are consistent with strong nuisance odors emanating from an improperly maintained facility. Due to the excessive number of citizen complaints, the facility is not being appropriately managed to minimize nuisance odors leaving the facility boundary. Most of the reported odor complaints are within a 2-mile radius of the Ford Claycomo facility, which is the proposed radius for this class action (Figure 1).

Figure 1. Summary of Nuisance Odor Complaints Communicated to Plaintiff's Counsel as of 10/29/2021 Confirming Odors within a 2-mile radius of the Ford Claycomo Assembly Plant



3.0 Atmospheric Dispersion Modeling

Atmospheric dispersion models use computational simulations to model the effects of physical processes on the movement of air pollutants (particles, gases and odors) within the lower atmosphere (troposphere). The first atmospheric dispersion model was developed by Sutton in 1918 to model dispersions of chemical warfare agents on the battlefield. Development of atmospheric dispersion models continued through the 1920's and 1930's with development of statistically-based models and the consideration of atmospheric turbulence. In 1957, Hay and Pasquill developed mathematical refinements to the Gaussian-based dispersion model for the transport of pollutants in the lower atmosphere [6,7]. Numerous field experiments were then performed to see how the contaminants were actually transported in the atmosphere and how well the experimental results agreed with the modeled results. Atmospheric dispersion models became widely used starting in the late 1960's. Further improvements in atmospheric dispersion models have included plume rise from stacks, building downwash, consideration of topography, multi-year meteorological data, chemical reactions and particle settling.

Atmospheric dispersion models are an important piece of local and regional air quality management systems. They are used to model pollutant dispersion in nearly all air permit applications, and they are accepted by all U.S. regulatory agencies (federal, state and local). These models can be used to identify source contributions to air quality issues from multiple sources and locations at the same time [8-11]. Atmospheric dispersion models are also used to quantify human and environmental exposure to air pollutants.

Odors are modeled in the same manner as other air pollutants, as they are just a subset of gaseous pollutants. So, dispersion models can be used to determine the magnitude and frequency of odor impacts. Odors are normally described in units of D/T (dilution-to-threshold), and communities often define nuisance odor levels at or greater than 7 D/T.

3.1 U.S. EPA Approved Atmospheric Dispersion Models

The U.S. EPA has defined in federal regulation the preferred atmospheric dispersion models (40 CFR Part 51, Appendix W). Local and state environmental departments require the use of the atmospheric dispersion model, AERMOD, in situations where the terrain is flat or complex and the distance between the source of the pollution and the location being evaluated is less than 50-km (31-miles). For AERMOD modeling studies, Dr. Cal uses a commercial implementation of the software developed by *Lakes Environmental*. This software has been accepted by local, state and federal agencies, and was used also used for this odor dispersion modeling analysis of emissions from the facility.

3.2 AERMOD Dispersion Model

The AERMOD atmospheric dispersion model is the latest iteration of these types of models and has been accepted as the preferred model by all local, state and federal regulatory agencies. It is also used extensively for non-regulatory analyses. AERMOD was jointly developed by the American Meteorological Society and the U.S. EPA. The model was approved for widespread use in 2000 [8], and published in the Federal Register in 2005 [FR vol. 70, no. 216, pp. 68218-68261]. Commercial implementations of AERMOD include terrain (AERMAP) and meteorological processing (AERMET) modules, multiprocessor support, graphical user interfaces and graphical output data.

3.3 AERMOD Theory

The AERMOD atmospheric dispersion model is designed to be used in the area of the atmosphere close to the surface of the earth, also called the planetary boundary layer (PBL). Close to the earth, pollutant dispersion is affected by mechanical turbulence from wind moving over the earth's surface. Convective turbulence, due to the solar heating of the earth's surface, also disperses pollutants in this region. AERMOD uses a mathematical Gaussian distribution function to calculate the concentration of pollutants at specific distances from sources. AERMOD employs updated physical and mathematical models to provide better predictions of atmospheric dispersion of pollutants compared to older models, such as SCREEN, PRIME and ISCST3. Generally, pollutant concentrations or odors decrease with increasing distance from the source; however, turbulence, stack parameters and local terrain may affect the location of the maximum concentration.

While both older atmospheric dispersion models [Eq. 1] and the current AERMOD model [Eq. 2] rely on a Gaussian mathematical distribution function to estimate pollutant concentrations, the AERMOD model takes into account many more variables resulting in a more accurate representation of pollutant dispersion. Both equations allow for the calculation of pollutant concentration within a 3-D space taking into accounts variables, such as emission source strength (Q), dispersion parameters (σ_y and σ_z) and stack release height (H). However, Eq. 2 includes additional variables for plume meander, a refined plume rise calculation and the combined effects of the combined effects of ambient, buoyancy-induced, and building-induced turbulence.

Equation 1 (Simple Gaussian):

$$C(x,y,z) = \frac{Q}{2\pi u_g \sigma_y \sigma_z} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2 - \frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2\right]$$

Equation 2 (AERMOD):

$$C_d\{x_r, y_r, z\} = \frac{Qf_p}{\sqrt{2\pi}\tilde{u}} F_y \cdot \sum_{j=1}^2 \sum_{m=0}^{\infty} \frac{\lambda_j}{\sigma_{zj}} \left[\exp\left(-\frac{(z - \Psi_{dj} - 2mz_i)^2}{2\sigma_{zj}^2}\right) + \exp\left(-\frac{(z + \Psi_{dj} + 2mz_i)^2}{2\sigma_{zj}^2}\right) \right]$$

AERMOD accounts for source emissions, topography, stack height, plume rise, meteorology, atmospheric turbulence to determine ground-level air pollutant concentrations. AERMOD can reliably estimate ground-level pollutant concentrations for both regulatory and non-regulatory purposes, and can therefore reliably estimate the dispersion of odors.

3.4 Using AERMOD to Investigate Odor Complaints

Atmospheric dispersion modeling can be used to model odors like other gaseous emissions. Ground-level pollutant concentrations and odors may vary by time of day due to changes in meteorology and source strength. When an investigator or citizen logs an odor complaint, it is at a specific location and is for a specific set of operational and meteorological parameters. Atmospheric dispersion models (AERMOD), using appropriate input data, can estimate when other odor threshold exceedances may occur within a modeled geographic area. Over a

specified time period, e.g. 1-year, AERMOD can display expected locations and frequencies of odor concentrations. Modeled time periods can range from a day to several years. Multiple sources can be investigated within the same model, and source groups can be turned on or off to see their contribution to overall pollutant concentrations within a geographic region. Essentially, the only limitation to the number of sources and the time periods is the availability of input data and computational power. Modeled geographic regions can be small, such as a neighborhood or up to a 50-km (31-mile) radius from the source(s). Odor threshold exceedances, e.g. levels greater than 7 D/T, can be specified within the model. Values below the odor threshold can be removed from the model output.

Varying meteorological conditions can also be investigated with AERMOD. For example, single or multi-year meteorological data can be used, or single events could be modeled, such as when wind is blowing from the west across a facility.

4.0 Data Required to Execute Model

All atmospheric dispersion models, including *AERMOD*, require accurate, real-world input data. Much of the data is available from publicly available sources. Sometimes on-site measurements must occur.

4.1 Meteorological Data

Meteorological data for the area around the facility can be obtained from publicly available sources, such as <https://www.webmet.com>.

4.2 Terrain Data

Terrain data for facility location and the surrounding community in USGS DEM format can be obtained from the WebGIS website (<http://www.webgis.com/>).

4.3 Source Parameters

The facility emits odorous species from stationary and sources. Emissions can be determined by on-site testing or estimated with emission factors.

4.4 Receptor Grids

An appropriate ground-level receptor grid can be established around the facility to model odor concentrations. The spacing of the receptor grid can be varied throughout the area, and specific locations can be highlighted with more tightly spaced grids.

4.5 Output Generated

The *AERMOD* dispersion model can be used to determine ground-level impacts of odorous species using 1-hr averaging. Concentration contours can be presented for all species of interest with the affected area. Concentrations of odorous species can be compared to odor thresholds. Results from AERMOD can be used to determine where, when, and to what extent odors have been dispersed onto nearby residential properties from the Ford Claycomo facility. This would entail a single analysis which, through the use of a receptor grid(s), would cover the entire class area (the area of concern near the facility).

6.0 Conclusions and Opinions

Based on a review of documentation provided by the plaintiff's counsel, Liddle Sheets Coulson P.C. [1-5], technical literature, and Dr. Cal's 34-years of experience in air quality engineering, Dr. Cal has the following conclusions and opinions:

1. The Ford Claycomo facility produces the F-150 truck and the Transit van. Also located at this facility is an industrial vehicle painting facility. The vehicle painting facility uses robotic sprayers in paint booths to coat the vehicles. Once the vehicles have been painted and clear-coated, they are cured in a paint oven and allowed to dry. The paint and clear-coat used is solvent-based and contains a substantial percentages of volatile organic compounds (VOCs), which will evaporate during the painting, curing and drying processes [1,4,5].
2. Residents living within a 2-mile radius of the facility have described nuisance odors using terms, such as paint, varnish, acetone, chemical, petroleum. Residents noted that, when nuisance odors were present, they tried to stay inside and would not open doors or windows to their home. Residents stated that the nuisance odors gave them headaches, itchy eyes, and affected their breathing [2,3]. These descriptions are consistent with strong nuisance odors emanating from an improperly maintained facility. Due to the excessive number of citizen complaints, the facility is not being appropriately managed to minimize nuisance odors leaving the facility boundary.
3. According to the air permit issues by the Missouri Department of Natural Resources, the facility has the potential to emit up to 2,363 tons per year of VOCs. Actual 2016 VOC emissions were noted to be 1,885 tons per year [4]. VOC Constituents of the paint and clear-coat are known to have significant odor intensities [5]. If these VOCs are not captured or destroyed before being vented to the atmosphere, they will become airborne. Once airborne, nuisance odors present in the VOC mixture will be transported to neighboring areas dependent upon local meteorology.
4. AERMOD is the preferred atmospheric dispersion model used by local, state and federal regulatory agencies and in non-regulatory situations, e.g. modeling of odor dispersion. The maximum effective range for AERMOD is 31-miles (50-km), which is within the 2-mile radius class area impacted by nuisance level odors emitted from the Ford Claycomo facility.
5. Atmospheric dispersion of odorous compounds from the Ford Claycomo facility can be modeled using data obtained from publicly available sources, including the air quality permit, facility air emissions testing, estimated emissions factors, local meteorological data and terrain data.
6. A detailed atmospheric dispersion modeling analysis centered around the Ford Claycomo facility can determine the frequency, intensity and location of nuisance odors within the class area. This would allow for a determination of which residential properties within the class area are impacted by Ford Claycomo's emissions and to what extent.

7.0 References

1. OTTO E. THORNBURG, on behalf of themselves and all others similarly situated, Plaintiffs, v. FORD MOTOR COMPANY, Defendant, United States District Court for the Western District of Missouri Western Division. Case No. 4:19-cv-01025-HFS, filed 12/24/2019.
2. Odor complaints data sheets for homes nearby the Ford Claycomo facility provided by the Missouri Department of Natural Resources, Division of Environmental Quality, Air Pollution Program.
3. Odor complaints data sheets for homes nearby the Ford Claycomo facility provided by Neff & Day, P.C, 117 W. Spring St., Neosho, MO 64850, tel. (417) 451-7003.
4. NSPS Air Permit No. 042018-009 and related construction permits and permits to operate 42008-001, 072011-009, OP2014-035, Ford Motor Company, Kansas City Assembly Plant, 8121 US NE Highway 69, Claycomo, MO 64119.
5. Odor Impact Assessment, Odor Science and Engineering, Project No. 2108-A-00, Ford Motor Company, Kansas City Truck Assembly Plant, January, 2019, 26 pp.
6. Hay, J. S. and F. Pasquill, 1957, "Diffusion from a fixed source at a height of a few hundred feet in the atmosphere," *J. Fluid Mech.*, 2:299-310.
7. Turner, D.B. and Schulze, Richard, *Atmospheric Dispersion Modeling*, Trinity Consultants, 2007.
8. U.S. EPA. 2004. AERMOD, DESCRIPTION OF MODEL FORMULATION, U.S. ENVIRONMENTAL PROTECTION AGENCY, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, September.
9. U.S. EPA. 2015a. ADDENDUM to the USER'S GUIDE FOR THE AERMOD METEOROLOGICAL PREPROCESSOR (AERMET), U.S. ENVIRONMENTAL PROTECTION AGENCY, Office of Air Quality Planning and Standards, Air Quality Assessment Division, Research Triangle Park, North Carolina 27711, June, + Original Version.
10. U.S. EPA. 2015b. ADDENDUM to the USER'S GUIDE FOR THE AMS/EPA REGULATORY MODEL – AERMOD, U.S. ENVIRONMENTAL PROTECTION AGENCY, Office of Air Quality Planning and Standards, Air Quality Assessment Division, Research Triangle Park, North Carolina 27711, August, and Original Version.
11. U.S. EPA, Air Quality Models, (<http://www.epa.gov/ttn/scram/aqmindex.htm>).

8.0 Engineering Services Disclaimer

Dr. Cal's analyses and conclusions only address the scope of work in this report and rely on materials received from Liddle Sheets Coulson, P.C. and other publicly available sources. Dr. Cal reserves the right to amend, change, or supplement the opinions and conclusions presented throughout this report, as new information becomes available.

Appendix A – Bio and CV for Dr. Mark P. Cal, P.E., BCEE

Biographical Sketch
Mark P. Cal, Ph.D., P.E., BCEE

Dr. Cal obtained a B.S. in Chemical Engineering and a Ph.D. in Civil & Environmental Engineering from the University of Illinois at Urbana-Champaign (UIUC). He has provided expert engineering consulting services for 30-years. Dr. Cal is also Vice President for Academic Affairs, Associate Campus Director and Professor of Civil and Environmental Engineering at New Mexico State University (NMSU) – Alamogordo, NM. For nearly 12 years he was Chair and Professor in the Department of Civil & Environmental Engineering at New Mexico Tech (NMT). As a professor, Dr. Cal has taught courses in air quality engineering, fate and transport of pollutants, heat & mass transfer, fluid mechanics, open channel hydraulics, pavement engineering, water resources engineering, and thermodynamics. Dr. Cal's research and consulting experience spans 30 years, and he has worked on projects in the areas of air pollution control, air quality science, atmospheric dispersion modeling, chemical fate and transport, water resources engineering, and heat and mass transfer. Dr. Cal has extensive community and government service, including more than 30 technical review panels for the U.S. EPA, and he is also a member of the NCEES Environmental Engineering P.E. exam development committee. He has authored more than 100 publications.

Dr. Cal is a licensed Professional Engineer (**P.E.**) in the State of New Mexico and a Board Certified Environmental Engineer (**BCEE**) by the American Academy of Environmental Engineers and Scientists with a specialty in air pollution engineering. Dr. Cal is also a graduate of the 2007 National Center for Asphalt Testing (NCAT) Professor Training Course. He has received many awards for his research and teaching, including New Mexico Tech's ***Distinguished Teaching Award***, the ***Young Civil Engineer Achievement Award*** from the Civil and Environmental Engineering Alumni Association at the University of Illinois at Urbana-Champaign, the American Chemical Society's ***R.A. Glenn Award***, and the New Mexico Society of Professional Engineers ***Outstanding Service Award***.

Dr. Cal has extensive experience in the areas air pollution engineering, air quality permitting and atmospheric dispersion modeling (AERMOD, SLAB, ISCST, SCREEN) – mainly in the areas of mining, mineral processing, construction materials, waste management and incineration and petroleum processing. He has developed air quality permits and performed atmospheric dispersion modeling in 9 U.S. states¹, and he has provided expert witness testimony in support of public and private companies, individuals, state agencies and litigation attorneys.

¹ New Mexico, California, Colorado, Illinois, Indiana, Maine, Nevada, New Jersey, Tennessee

Mark P. Cal, Ph.D., P.E., BCEE

Consulting Engineer

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EDUCATION

1995	Ph.D.	Civil & Environmental Engineering	University of Illinois at Urbana-Champaign
1993	M.S.	Civil & Environmental Engineering	University of Illinois at Urbana-Champaign
1991	B.S.	Chemical Engineering	University of Illinois at Urbana-Champaign

PROFESSIONAL REGISTRATIONS AND CERTIFICATIONS

- Registered Professional Engineer (P.E.), State of New Mexico, No. 16651
- Board Certified Environmental Engineer (BCEE), Air Pollution Engineering Specialty, American Academy of Environmental Engineers and Scientists (AAEES)

SPECIALTIES

Air pollution control, atmospheric dispersion modeling, ambient air quality, heat and mass transfer, multimedia chemical fate and transport (air, water and soil), water resources engineering, pavement engineering

PROFESSIONAL EXPERIENCE

1991-present	Sole Proprietor , MPC Engineering, provide consulting engineering services in the areas of civil & environmental engineering and specializing in air quality engineering and dispersion modeling.
2015-present	Vice President for Academic Affairs, Associate Campus Director, Professor of Civil and Environmental Engineering (tenured) , New Mexico State University–Alamogordo
2013-2015	Division Head for Math, Engineering, Science and Health, Professor of Civil and Environmental Engineering (tenured) , New Mexico State University–Alamogordo
2002-2013	Department Chair , Department of Civil & Environmental Engineering, New Mexico Tech, Socorro, NM.
2013-2014	Director, New Mexico Environmental Finance Center (US EPA Region 6) , Energetic Materials Research and Testing Center (EMRTC), New Mexico Tech, Socorro, NM.
2008-2013	Professor of Civil & Environmental Engineering (tenured) , Department of Civil & Environmental Engineering, New Mexico Tech, Socorro, NM.
1999-2013	Adjunct Faculty , Chemical Engineering Program, New Mexico Tech, Socorro, NM.
2003-2008	Associate Professor of Civil & Environmental Engineering (tenured) , Department of Civil & Environmental Engineering, New Mexico Tech, Socorro, NM.
1998-2003	Assistant Professor of Environmental Engineering , Department of Environmental Engineering, New Mexico Tech, Socorro, NM.
1996-1998	Adjunct & Visiting Assistant Professor of Civil & Environmental Engineering (non-tenure track) , Department of Civil & Environmental Engineering, University of Illinois at Urbana-Champaign (UIUC).

- Taught undergraduate and graduate courses in air quality engineering and science.
 - Advised graduate students.
- 1996-1998 **Research Chemical Engineer**, Illinois State Geological Survey, Minerals Engineering Section, Champaign, IL.
- Managed projects in the areas of coal gasification, catalyst preparation and SO_x and NO_x control from flue gases.
- 1995-1996 **Post-Doctoral Research Associate**, University of Nevada-Desert Research Institute, Energy and Environmental Engineering Center, Reno, NV.
- 1991-1994 **Graduate Research Assistant**, Department of Civil & Environmental Engineering, UIUC.
- 1992 and 1994 **Graduate Teaching Assistant**, Air Resources Engineering (CE 349), Department of Civil & Environmental Engineering, UIUC.
- 1987-1991 **Research Assistant**, Illinois State Geological Survey, Applied Research Laboratory, Champaign, IL.

COURSES TAUGHT

Air pollution control, atmospheric dispersion modeling, applied principles of environmental engineering, environmental law, fluid mechanics, heat and mass transfer, thermodynamics, open channel hydraulics, pavement materials and design, senior design

SHORT COURSES TAUGHT

- 2008 “Roadside Safety Design,” Presented to the New Mexico Department of Transportation (NMDOT), Santa Fe, NM, July 8-10 (3 days).
- 2005 “Air Pollution Control Engineering,” presented at the University of New Mexico to train faculty from Eurasian National University, Kazakhstan, Albuquerque, NM, July 4-8, 2005 (16 hours).
- 2001-05 “Heat Transfer & Thermodynamics,” Fundamentals of Engineering (FE) Review Course (2 hours per semester).
- 2000 “Recent Developments in Air Pollution Control,” presented as part of a topical conference on air pollution, AIChE Spring National Meeting, Atlanta, GA, March 5, 2000 (8 hours).

INDIVIDUAL HONORS AND AWARDS

- 2016 [Certificate of Appreciation](#) for 10-years of service on the Environmental Engineering P.E. Exam Development Committee, National Council of Examiners for Engineering and Surveying (NCEES).
- 2011 [Certificate of Appreciation](#) for 5-years of service on the Environmental Engineering P.E. Exam Development Committee, National Council of Examiners for Engineering and Surveying (NCEES).
- 2009 [Outstanding Service Award](#), New Mexico Society of Professional Engineers (NMSPE). Recognition for outstanding service to practicing engineers and students within the State of New Mexico.
- 2002 [Distinguished Teaching Award](#), New Mexico Tech. Awarded to one faculty member per year.
- 2001 [Young Civil Engineer Achievement Award](#), Civil and Environmental Engineering (CEE) Alumni Association, University of Illinois at Urbana-Champaign. Not more than 0.1% of UIUC CEE Alumni receive this award.
- 1997 [R.A. Glenn Best Paper Award](#), American Chemical Society, Fuel Chemistry Division. Paper entitled “Cleanup of Hot Coal Gas with Carbon-based Sorbents.”

- 1997 [Outstanding Staff Member Award](#), Illinois State Geological Survey, “In recognition of your distinguished achievements in the field of environmental engineering through research on clean coal technology, improvement of laboratory facilities, and mentoring of colleagues for the benefit of the Survey and the people of Illinois during the first three years of your employment.”
- 1992 [First place award, student paper competition](#), Lake Michigan States Chapter of the Air and Waste Management Association (AWMA). Paper entitled “Theoretical and Experimental Results Describing the Adsorption of VOCs onto Activated Carbon Fibers.”
- 1992 [First place award, student poster competition](#), 85th Annual Meeting and Exhibition of AWMA, Kansas City, Missouri, June. Poster entitled “Theoretical and Experimental Results Describing the Adsorption of VOCs onto Activated Carbon Fibers.”
- 1992 [Graduate student scholarship](#) awarded by the Central Illinois Chapter of AWMA.

GROUP AWARDS

- 2011 [AAEE University Research Honor Award](#), “Electrothermal Swing Adsorption work for VaPRRS and Steady-State Tracking,” awarded to [Mark J. Rood](#), University of Illinois at Urbana-Champaign, with research by [Mark P. Cal](#), James Hay, Byung Kim, Pat Sullivan, Mehrdad Lordgooei, David Ramirez, Hamidreza Emamipour, Zaher Hashisho, Amit Kaldate, Deborah Thurston, and Hyun-Keun Son, American Academy of Environmental Engineers (AAEE).
- 1992 [Incomplete List of Excellent Teachers](#), Air Resources Engineering, CE 349

STUDENT ADVISEE AWARDS

- 2002 First place award, student poster competition, Annual Meeting of the Air and Waste Management Association (AWMA). Poster entitled “Destruction of 1,1,1,-Trichloroethane using Non-Thermal Plasmas” by Sandeep Agnihotri, M.S. research, (advisor: M.P. Cal), June
- 2002 First place award, student paper competition given by Lake Michigan States Section of the Air and Waste Management Association (AWMA). Paper entitled “Destruction of 1,1,1,-Trichloroethane using Non-Thermal Plasmas” by Sandeep Agnihotri, M.S. research, (advisor: M.P. Cal), April

PROJECT MANAGEMENT

Principal Investigator (PI) of projects in the areas of air resources engineering, ambient air quality, chemical fate and transport in multimedia environments (air, water, soil), multimedia transport of energetic materials (explosives), development of structures and testing of their performance to energetic materials, water resources engineering, drinking water quality and treatment, pavement engineering, geochemical and engineered fate analysis, corrosion of waste storage packages.

[Research Grants and Contracts as PI – 21 projects at a total funding level of \\$6.2 million, Investigator \(I\) on 10 others](#)

MAJOR PROJECTS AND RESEARCH GRANTS

(PI = principal investigator, I = investigator)

1. **(PI)** New Mexico Environmental Finance Center, U.S. Environmental Protection Agency, 2013-2014, **\$845,000**
2. **(PI)** Training and Technical Assistance to Small Public Water Systems, U.S. Environmental Protection Agency, 2013-2014, **\$695,695**
3. **(PI)** Environmental Finance Network Training and Technical Assistance for Small Water Systems, U.S. Environmental Protection Agency, 2012-2014, **\$2,666,000**

4. **(PI)** Geochemical Analysis of Deep Boreholes, Sandia National Laboratories, 2012-13, **\$59,480** (with Dr. Patrick V. Brady)
5. **(PI)** Establishing and Validating an Aggradation Risk Index for Use in Drainage Design, New Mexico Department of Transportation (NMDOT), 2009-2012, **\$219,865** (with Dr. Clinton P. Richardson)
6. **(PI)** Blast Modeling Codes for Urban Environments, Energetic Materials Research and Testing Center (EMRTC) and Tactical Services Working Group (TSWG), 2007-08, **\$56,205** (with Mike Stanley)
7. **(PI)** Pavement Evaluation at New Mexico Airports, New Mexico Department of Transportation (NMDOT)-Aviation Division, 2006-10, **\$166,927** (with Dr. Paul W. McMullin (2006-07))
8. **(PI)** Subway Tunnel Design and Construction, Energetic Materials Research and Testing Center (EMRTC) and Tactical Services Working Group (TSWG), 2006-07, **\$61,378** (with Mike Stanley and Dr. Paul W. McMullin)
9. **(PI)** Construction and Performance Evaluation of a Novel Wastewater Treatment Filter, Global Filter, a Division of Gordon Construction Company, 2005-07, **\$264,840** (with Dr. Frank Y.C. Huang)
10. **(PI)** Corrosion of Waste Storage Packages, Sandia National Laboratories, 2004-2006, **\$121,982** (with Dr. Patrick V. Brady)
11. **(PI)** Geochemical and Engineered Fate Analysis (Adsorption of Perchlorate on Granular Activated Carbon Media), Sandia National Laboratories, 2003-2005, **\$98,450** (with Dr. Patrick V. Brady)
12. **(PI)** Determination of the Unsaturated Soil-Water Partitioning Coefficient for Explosives Transport in Soil, Sandia National Laboratories and Army Night Vision Laboratory, 2001-2002, **\$75,000** (with Dr. Robert Bowman)
13. **(PI)** Destruction of Benzene in a Non-Thermal Plasma Reactor, HICREST, 2000-2001, **\$5,000**
14. **(PI)** Destruction of Gas-Phase Pollutants using Non-Thermal Plasmas, Waste-Management Education & Research Consortium (WERC), 1999, **\$7,500**
15. **(PI)** Application of Soil Physics to Landmine Chemical Detection, Sandia-University Research Program (SURP), 1998-1999, **\$34,952**
16. **(PI)** Environmental Impacts to the Chemical Signature Emanating from Shallow UXO and Buried Landmines, Sandia National Laboratories and Strategic Environmental Research and Development Program (SERDP), 1998-2000, **\$210,000** (with Dr. Robert Bowman)
17. **(PI)** Development of Metal-Based Sorbents for Hot Gas Cleanup, Illinois Clean Coal Institute (ICCI), 1997-98, **\$80,000**
18. **(PI)** Production of Novel Sorbents from Illinois Coal for Hot Gas Cleanup, University of Illinois at Urbana- Champaign Campus Research Board, **\$12,025**
19. **(PI)** Carbon-Based Sorbents for Hot Gas Cleanup, ICCI, 1996-98, **\$144,532**
20. **(PI)** Development of Carbon Molecular Sieves for Gas Separation, ICCI, 1996-97, **\$48,387**
21. (I) Development of an Activated Carbon Fiber Cloth Adsorption/Regeneration System to Recover and Reuse Toxic Organic Compounds, Hazardous Waste Research and Information Center (HWRIC), 1996-97, PI: Dr. Mark J. Rood, University of Illinois at Urbana-Champaign
22. (I) Development of Activated Carbon for Combined SO₂/NO_x Removal, ICCI, 1996-97, PI: Dr. Anthony A. Lizzio, Illinois State Geological Survey
23. (I) Methods to Evaluate and Improve the Gasification Behavior of Illinois Coal, ICCI, 1996-97, PI: Dr. Anthony A. Lizzio, Illinois State Geological Survey
24. (I) Carbon Analysis of Interagency Monitoring of Protected Visual Environments (IMPROVE) Filters, National Park Service et al., 1995-96, PIs: Dr. Judith Chow and Dr. John Watson, Desert Research Institute
25. (I) Imperial Valley/Mexicali Cross Border PM₁₀ Transport Study, U.S. Environmental Protection Agency, Region IX, 1995, PIs: Dr. Judith Chow and Dr. John Watson, Desert Research Institute

26. (I) PM₁₀ and PM_{2.5} Variations in Time and Space, U.S. Environmental Protection Agency, 1995, PIs: Dr. Judith Chow and Dr. John Watson, Desert Research Institute
27. (I) Mt. Zirkel Wilderness Area Reasonable Attribution Study of Visibility Impairment, Colorado Department of Public Health, 1995-96, PIs: Dr. Judith Chow and Dr. John Watson, Desert Research Institute
28. (I) Review and Compilation of Information Pertaining to Asbestos Fibers in Indoor Environments, Law Firm of Segal McCambridge Singer & Mahoney, Ltd., 1992, PI: Dr. Mark J. Rood, University of Illinois at Urbana-Champaign
29. (I) Adsorption of Indoor Organic Gases onto Activated Carbon Fibers, Center for Indoor Air Research, 1991-94, PIs: Dr. Mark J. Rood and Dr. Susan M. Larson, University of Illinois at Urbana-Champaign
30. (I) Sorbent Evaluation for Pressurized Fluidized-Bed Combustion, Center for Research on Sulfur in Coal, 1989-90, PI: Dr. Massoud Rostam-Abadi, Illinois State Geological Survey

EDITORIAL SERVICE

- 2004-2006 Associate Editor, *ASCE Journal of Environmental Engineering*
- Present Reviewed manuscripts for *J. Air & Waste Management Association*, *J. Environmental Engineering*, *Carbon*, *Environmental Progress*, *Environmental Engineering Science*, *Advances in Environmental Research*, *Environmental Science & Technology*, *Energy & Fuels*, *Chemosphere*, *Indoor Air*, and *Industrial & Chemical Engineering Research*, *International Journal of Greenhouse Gas Control*

BOARD AND COUNCIL SERVICE

- 2005-present National Council of Examiners for Engineering and Surveying (NCEES) Environmental Engineering PE Exam Development Committee, Clemson/Seneca, SC
- 2015-present Chair, American Academy of Environmental Engineers and Scientists (AAEES), Air Pollution Control Examination Committee
- 2008-2013 Director, New Mexico Air & Waste Management Association (A&WMA), University Representative
- 2007-2013 Vice President of Education, New Mexico Society of Professional Engineers (NMSPE), New Mexico Tech Representative
- 2010-2013 Director, New Mexico Engineering Foundation (NMEF)
- 2000-2003 Director, American Institute of Chemical Engineers (AIChE), Fuels & Petrochemicals Division

PROFESSIONAL SOCIETY SERVICE

- 2005-present National Council of Examiners for Engineering and Surveying (NCEES) Environmental Engineering PE Exam Development Committee, Clemson/Seneca, SC
- 2015-present Chair, American Academy of Environmental Engineers and Scientists (AAEES), Air Pollution Control Examination Committee
- 2021 NCEES Environmental Engineering PE Exam Development Committee Meeting, March
- 2021 NCEES Environmental Engineering PE Exam Development Committee Meeting, September
- 2020 NCEES Environmental Engineering PE Exam Development Committee Meeting, March
- 2020 NCEES Environmental Engineering PE Exam Development Committee Meeting, September
- 2019 NCEES Environmental Engineering PE Exam Development Committee Meeting, March

2018	NCEES Environmental Engineering PE Exam Development Committee Meeting, September
2018	NCEES Environmental Engineering PE Exam Cut Score Meeting, May
2018	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2017	NCEES Environmental Engineering PE Exam Development Committee Meeting, October
2016	NCEES Environmental Engineering PE Exam PAKS Study, August
2015	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2015	Air and Waste Management Association (AWMA), Judge, National Scholarship Awards
2014	NCEES Environmental Engineering PE Exam Development Committee Meeting, September
2014	Air and Waste Management Association (AWMA), Judge, National Paper Awards
2014	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2012-2013	Master of Ceremonies, Order of the Engineer, Link 85, New Mexico Tech
2013	New Mexico Society of Professional Engineers (NMSPE), Awards Committee for Young Engineer of the Year, Engineer of the Year, Project of the Year, and Outstanding Service
2013	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2012	Air and Waste Management Association (AWMA), Education Council, Judge Student Paper Awards
2012	New Mexico Society of Professional Engineers (NMSPE), Awards Committee for Young Engineer of the Year, Engineer of the Year, Project of the Year, and Outstanding Service
2009-16	American Academy of Environmental Engineers (AAEE), Air Pollution Control Examination Committee
2004-11	Chief Proctor, NCEES Fundamentals of Engineering (FE) Exam, New Mexico Tech Testing Site
2012	Air & Waste Management Association (AWMA), Student Paper Awards Committee
2012	NCEES Environmental Engineering PE Exam Development Committee Meeting, August
2012	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2011	NCEES Environmental Engineering PE Exam Development Committee Meeting, October
2011	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2010	NCEES Environmental Engineering PE Exam Development Committee Meeting, October
2010	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2009	NCEES Environmental Engineering PE Exam Development Committee Meeting, February
2009	Air & Waste Management Association (AWMA), Thesis Award Committee
2008	NCEES Environmental Engineering PE Exam Development Committee Meeting, October
2008	NCEES Environmental Engineering PE Exam Development Committee Meeting, February
2007	NCEES Environmental Engineering PE Exam Development Committee Meeting, October
2007	NCEES Environmental Engineering PE Exam Development Committee Meeting, March
2006	NCEES FE Exam Preparation Meeting, February
2006	NCEES Environmental Engineering PE Exam Development Committee, October
2006	NCEES Environmental Engineering PE Exam Development Committee, February
2005	NCEES FE Exam Standard Setting Study, December
2003-04	Proctor, Fundamentals of Engineering (FE) Exam, New Mexico Tech Testing Site
1998-2001	Programming Chair, Area 16c: Gas, Division of Fuels and Petrochemicals, AIChE

CONFERENCE SESSIONS CHAIRED

- 2000 Meeting Programming Chair, Recent Developments in Air Pollution Control Topical Conference, AIChE, Atlanta, GA, March 5-9
- 2000 Meeting Programming Chair, 1st Annual International Conference on Gas Processing Topical Conference, AIChE, Atlanta, GA, March 5-9
- 2000 Session Chairman, "Plasma Processing for Gas-Phase Pollution Control," AIChE, Spring National Meeting, Session TF005, Atlanta, GA, March 5-9
- 2000 Session Chairman, "Adsorption and Absorption Processes for Air Pollution Control," AIChE, Spring National Meeting, Session TA009, Atlanta, GA, March 5-9
- 1999 Session Chairman, "Adsorption and Gas Separation Processes," AIChE, Session 116, Houston, TX, March 17
- 1998 Session Chairman, "Adsorption and Gas Separation Processes," AIChE, Session 16c01, New Orleans, LA, March 11
- 1997 Session Chairman, "Novel Carbons for Gas Separation, Cleanup, and Storage," 23rd Biennial Conference on Carbon, Session 8B, State College, PA, July 13-18
- 1996 Session Chairman, "Production and Use of Carbon-Based Materials for Environmental Cleanup," American Chemical Society (ACS) Symposium, New Orleans, LA, March 24-28

REVIEW AND ADVISORY PANELS

- 2019 Research Proposal Review Panel, U.S. EPA, SBIR Phase II, August 6-8
- 2018 Research Proposal Review Panel, U.S. EPA, SBIR Phase II, July 24-26
- 2018 Research Proposal Review Panel, U.S. EPA, People, Prosperity, and the Planet (P3)–Air Quality (Q1), April 3-4
- 2015 Research Proposal Review Panel, Strategic Environmental Research and Development Program (SERDP), ERSON 16-03, Improved Understanding of Particle Deposition from Low-Order Detonations of High Explosive Munitions, April 29
- 2014 Proposal Reviewer, Canadian Centre for Clean Coal/Carbon and Mineral Processing Technologies (C5MPT)
- 2010-2013 New Mexico Tech Faculty Representative, Udall Scholarship
- 2012 Research Proposal Review Panel, U.S. EPA, SBIR Phase I: Innovation in Manufacturing (B1), September 4-6
- 2012 Research Proposal Review Panel, U.S. EPA, STAR Grant, Anthropogenic Influences on Organic Aerosol Formation and Regional Climate Implications (D1/D2), August 7-9
- 2012 Research Proposal Review Panel, U.S. EPA, People, Prosperity, and the Planet (P3) Award Program, Topic Codes Q1/Q7, March 26-27
- 2011 Research Proposal Review Panel, U.S. EPA, SBIR Phase II, December 7-9
- 2011 Research Proposal Review Panel, U.S. EPA, STAR Grant, Developing the Next Generation of Air Quality Measurement Technology, May
- 2011 Research Proposal Review Panel, U.S. EPA, People, Prosperity, and the Planet (P3) Award Program, Topic Codes Q4/Q5, March 30-April 1
- 2010 Research Proposal Review Panel, U.S. EPA, SBIR Phase II, December 7-9
- 2010 Research Proposal Review Panel, U.S. EPA, SBIR Phase I, Air Pollution Monitoring and Control (G1), August 25-26
- 2010 Research Proposal Review Panel, U.S. EPA, SBIR Phase I, Innovation in Manufacturing (B1), August 11-12

2009-10	Texas Higher Education Coordinating Board, Norman Hackerman Advanced Research Program (NHARP), Research Proposal Review Panel, November, 2009 and March 3-5, 2010
2010	Research Proposal Review Panel, U.S. EPA, STAR Fellowship Panel 09-A1-J1 February 23-25
2010	Research Proposal Review Panel, U.S. EPA, STAR Fellowship: Clean Air (09-B1), January
2009	Research Proposal Review Panel, U.S. EPA, SBIR Phase II, December
2009	Research Proposal Review Panel, U.S. EPA, SBIR Phase I, Innovation in Manufacturing (B1), September
2009	Research Proposal Review Panel, U.S. EPA, SBIR Phase I, Air Pollution Monitoring and Control (G1), September
2008	Research Proposal Review Panel, U.S. EPA, SBIR Phase II, December
2008	Research Proposal Review Panel, U.S. EPA, STAR SBIR Phase I 08-F, Monitoring and Control of Air Pollution, September
2008	Research Proposal Review Panel, U.S. EPA, STAR Fellowship: Environmental Engineering, March
2007	Research Proposal Review Panel, U.S. EPA, SBIR Phase II, December
2007	Research Proposal Review Panel, U.S. EPA, SBIR Phase I 07-F1, Control of Air Pollution, August
2007	Research Proposal Review Panel, U.S. EPA, STAR Fellowship: Atmospheric Sciences, March
2007	Research Proposal Review Panel, U.S. EPA, STAR Fellowship: Environmental Engineering, February
2006	Research Proposal Review Panel, U.S. EPA, SBIR Phase I 06-A2, Control of Air Pollution, August
2006	Research Proposal Review Panel, U.S. EPA, STAR Fellowship, Atmospheric Sciences, February
2005	Research Proposal Review Panel, National Science Foundation (NSF), SBIR/STTR Phase I, Sensors: Non-Destructive Testing I
2005	Research Proposal Review Panel, U.S. EPA, STAR Fellowship, Atmospheric Sciences
2004	Research Proposal Review Panel, NSF, SBIR/STTR Phase I, C9B Environmental, Transportation, Structural Panel
2004	Research Proposal Review Panel, U.S. EPA, SBIR Phase I 04-A4, Air Pollution in Arid Climates and 04-B3, Waste Gasification
2004	Proposal Reviewer, United States Department of Agriculture (USDA), Air, Water and Soils Program
2003	Research Proposal Review Panel, U.S. EPA, SBIR Phase I, 03-C3, Air Pollution Monitoring Equipment
2003	Research Proposal Review Panel, NSF, SBIR Phase I H.1, Remote Sampling & Measurement
2003	Proposal Reviewer, Illinois Council on Food and Agricultural Research (C-FAR)
2003	Proposal Reviewer, NSF, Division of Chemical & Transport Systems
2003	Research Proposal Review Panel, NSF, Electricity Power Networks Efficiency and Security (EPNES)
2002	Research Proposal Review Panel, NSF, Biological and Environmental Systems, CAREER Program

2002	Research Proposal Review Panel, NSF, Biological and Environmental Systems
2000-2001	SBIR Proposal Review Panel, United States Department of Agriculture (USDA), Air, Water and Soils Program
2000-2002	Proposal Reviewer, Research Management Group, LLC

PUBLICATION CITATIONS

Total Publications ~ 100

<http://scholar.google.com/citations?user=Sy9-MIsAAAAJ>

Scopus h-index = 15, i10-index = 15, Citations = 1062

Google Scholar 200 most cited civil engineering authors ordered by Scopus h-index (2007-2012)

JOURNAL PUBLICATIONS

1. Bulut, G.G, **Cal, M.P.**, Richardson, C.P., Gallegos, J.B. (2012) "A Statewide Soil Erosion Risk Map for New Mexico using GIS and Fuzzy Logic," *New Mexico Journal of Science*, "New Mexico's Water Resources," Kurt S.J. Anderson Editor, Volume 46, December 2012, pp. 27-38.
2. Richardson, C.P., Gallegos, J.B., Ealey, J., **Cal, M.P.** (2012) "A GIS-based Estimate of Net Erosion Rate for Semi-Arid Watersheds in New Mexico" *New Mexico Journal of Science*, "New Mexico's Water Resources," Kurt S.J. Anderson Editor, Volume 46, December 2012, pp. 17-26.
3. Gallegos, J.B., Richardson, C.P., **Cal, M.P.**, Bulut, G.G. (2012) "A GIS-based Hydraulic Bulking Factor Map for New Mexico," *ASCE Journal of Hydrologic Engineering*, doi:10.1061/(ASCE)HE.1943-5584.0000727.
4. Agnihotri, S., **Cal, M.P.**, Prien, J. (2004) "Destruction of 1,1,1-Trichloroethane using Non-Thermal Plasma," *J. Environmental Engineering*, Vol. 130, No.3, pp. 349-355.
5. **Cal, M.P.**, Schluep, M. (2001) "Destruction of Benzene with Non-thermal Plasma in Dielectric Barrier Discharge Reactors," *Environmental Progress*, Vol. 20, No. 3, pp. 151-156.
6. Qi, S., Hay, K.J., **Cal, M.P.** (2000) "Predicting Humidity Effect on Adsorption Capacity of Activated Carbon for Organic Vapors," *Advances in Environmental Research*, Vol. 4, No. 4, pp. 357-362.
7. **Cal, M.P.**, Strickler, B.W., Lizzio, A.A., Gangwal, S.K. (2000) "High Temperature Hydrogen Sulfide Adsorption on Activated Carbon--II. Effects of Gas Temperature, Gas Pressure and Sorbent Regeneration," *Carbon*, Vol. 38, pp. 1767-1774.
8. **Cal, M.P.**, Strickler, B.W., Lizzio, A.A. (2000) "High Temperature Hydrogen Sulfide Adsorption on Activated Carbon--I. Effects of Gas Composition and Metal Addition," *Carbon*, Vol. 38, pp. 1757-1765.
9. Qi, S., Hay, K.J., Rood, M.J., **Cal, M.P.** (2000) "Carbon Fiber Adsorption Using Quantitative Structure-Activity Relationship," *J. Environmental Engineering*, Vol. 126, No. 9, pp. 865-868.
10. Qi, S., Hay, K.J., Rood, M.J., **Cal, M.P.** (2000) "Equilibrium Adsorption and Heat of Adsorption Capacities for Water Vapor and Activated Carbon," *J. Environmental Engineering*, Vol. 126, No. 3, pp. 267-271.
11. **Cal, M.P.**, Rood, M.J., Larson, S.M. (1997) "Gas Phase Adsorption of Volatile Organic Compounds and Water Vapor on Activated Carbon Cloth," *Energy and Fuels*, Vol. 11, No. 2, pp. 311-315.
12. **Cal, M.P.**, Rood, M.J., Larson, S.M. (1996) "Removal of VOCs from Humidified Gas Streams using Activated Carbon Cloth," *Gas Separation and Purification*, Vol. 10, No. 2, pp. 117-121.
13. Dimotakis, E., **Cal, M.P.**, Economy, J., Rood, M.J., Larson, S.M. (1995) "Water Vapor Adsorption on Chemically Treated Activated Carbon Cloths," *Chemistry of Materials*, Vol. 7, No. 12, pp. 2269-2272.
14. Dimotakis, E., **Cal, M.P.**, Economy, J., Rood, M.J., Larson, S.M. (1995) "Chemically Treated Activated Carbon Cloths (ACCs) for Removal of Volatile Organic Carbons from Gas Streams: Evidence for Enhanced Physical Adsorption," *Environmental Science and Technology*, Vol. 29, pp. 1876-1880.
15. **Cal, M.P.**, Rood, M.J., Larson, S.M. (1994) "Adsorption of Acetone and Benzene onto Activated Carbon Fibers: Comparison of Experimental and Modeled Isotherms," *Environmental Progress*, Vol. 13, No. 1, pp. 26-30.

BOOK CHAPTERS

- Cal, M.P.** (2001) "Discharges of Hazardous Waste into the Atmosphere," Chapter 3, McGraw-Hill Handbook of Complex Environmental Remediation Problems, Jay Lehr, et al. Ed., ISBN: 0-07-027689-7
- Cal, M.P.** (2000) "Particulate Controls," Chapter 13-4, McGraw-Hill Handbook of Environmental Science, Health & Technology, Jay Lehr, Ed., pp. 13.43-13.54, ISBN: 0-07-038309-X
- Cal, M.P.** (2000) "Gas Controls," Chapter 13-5, McGraw-Hill Standard Handbook of Environmental Science, Health & Technology, Jay Lehr, Ed., pp. 13.55-13.68, ISBN: 0-07-038309-X
- Byers, W. and **Cal, M.P.** (2000) "Charcoal/Activated Carbon," Air Pollution Engineering Manual, Wayne T. Davis, Ed., Air and Waste Management Association and Wiley Interscience, pp. 368-371, ISBN: 0-471-33333-6.

EDITORSHIPS

- Cal, M.P.**, (2004-2006) Associate Editor, *ASCE Journal of Environmental Engineering*
- Cal, M.P.** (2001) *Environmental Progress*, Special Issue on Air Pollution Control, Vol. 20, No. 3.
- Cal, M.P.** and Siegel, D. (2000) "Recent Developments in Air Pollution Control," Topical Conference Proceedings, AIChE Spring National Meeting, March 5-9, Atlanta, GA, 230 pp.
- Cal, M.P.** and Chiu, C. (2000) "1st International Conference on Gas Processing," Topical Conference Proceedings, AIChE Spring National Meeting, March 5-9, Atlanta, GA, 203 pp.

DOCTORAL DISSERTATION

- Cal, M.P.** (1995), "Characterization of Gas Phase Adsorption Capacity of Untreated and Chemically Treated Activated Carbon Cloths," Doctoral Dissertation, University of Illinois at Urbana-Champaign, UMI Press. Graduate Advisor: Dr. Mark J. Rood. Doctoral Dissertation Committee Members: Dr. Mark J. Rood (chair), Dr. Susan M. Larson, Dr. Massoud Rostam-Abadi, Dr. James Economy.

PRESENTATIONS AND CONFERENCE PROCEEDINGS

(presenters names are underlined)

1. Gallegos, J. B., Richardson, C.P., **Cal, M.P.**, Bulut, G.G. (2012) "A GIS-based Hydraulic Bulking Factor Map for New Mexico," World Environmental & Water Resources (ASCE/EWRI) Congress, Albuquerque, NM, May 20-24
2. Bulut, G.G., **Cal, M.P.**, Richardson, C.P., Gallegos, J.B. (2012) "A GIS-based Soil Erosion Risk Map for New Mexico," World Environmental & Water Resources (ASCE/EWRI) Congress, Albuquerque, NM, May 20-24.
3. **Cal, M.P.**, (2010) "Airport Asphalt Concrete Design and Maintenance," presented at Holloman Air Force Base, NM, May 26.
4. **Cal, M.P.**, Lucero, J., Baca, T. (2009) "Pavement Management System for New Mexico Airports," presented at 46th Annual Paving Conference, Albuquerque, NM, January 6.
5. **Cal, M.P.**, Bowman, R., Phelan, J.M., Webb, S.W. (2007) "Laboratory Data and Model Comparisons of the Transport of Chemical Signatures From Buried Landmines/UXO," presented to Joint IED Defeat Organization (JIEDDO), New Mexico Tech, May 3, 2007.
6. Agnihotri, S., **Cal, M.P.**, Prien, J. (2002) "Destruction of 1,1,1-Trichloroethane in a Non-thermal Plasma Reactor," AWMA Annual Conference & Exhibition, Baltimore, MD, June.
7. Phelan, J.M., Webb, S.W., Gozdor, M., **Cal, M.P.**, Barnett, J.L. (2001) "Effect of Soil Wetting and Drying on DNT Vapor Flux -- Laboratory Data and T2TNT Model Comparisons," Proceedings of the

SPIE 15th Annual International Symposium on Aerospace/Defense Sensing, Simulation and Controls, Orlando, FL, April 16-20.

8. **Cal, M.P.**, Schluep, M. (2000) "Destruction of Benzene in a Dielectric Barrier Discharge Plasma Reactor," AWMA Annual Conference & Exhibition, Salt Lake City, UT, June 18-22.
9. **Phelan, J.M.**, Gozdor, M., Webb, S.W., **Cal, M.P.** (2000) "Laboratory Data and Model Comparisons of the Transport of Chemical Signatures From Buried Landmines/UXO," Proceedings of the SPIE 14th Annual International Symposium on Aerospace/Defense Sensing, Simulation and Controls, Detection and Remediation Technologies for Mines and Minelike Targets V, April 24-28, 2000, Orlando, FL.
10. **Cal, M.P.**, Schluep, M. (2000) "Destruction of VOCs Using Non-Thermal Plasmas," Recent Developments in Air Pollution Control Topical Conference, AIChE Spring National Meeting, Atlanta, GA, March 5-9, paper 115d, p. 125.
11. Qi, S., Hay, K.J., **Cal, M.P.** (1999) "Effect of Water on Adsorption of Organic Vapors onto Microporous Activated Carbon," AIChE Spring National Meeting, Houston, TX, March 14-18, paper 116c.
12. **Cal, M.P.**, Strickler, B.W. (1998) "H₂S Removal from Hot Coal Gas Streams with Carbon-Based Sorbents," AIChE Spring National Meeting, New Orleans, LA, March 9-12.
13. **Cal, M.P.**, Strickler, B.W., Lizzio, A.A., Rood, M.J. (1997) "Cleanup of Hot Coal Gas with Carbon-Based Sorbents," 214th ACS National Meeting, Division of Fuel Chemistry, Las Vegas, NV, September 7-11, pp. 872-876.
14. **Slota, K.J.**, **Cal, M.P.**, Lizzio, A.A., Rood, M.J. (1997) "Preparation of Carbon Molecular Sieves for Oxygen Separation from Air," 23rd Biennial Conference on Carbon, State College, PA, July 13-18.
15. **Strickler, B.W.**, **Cal, M.P.**, Lizzio, A.A., Rood, M.J. (1997) "Hot Gas Cleanup with Carbon-Based Sorbents," 23rd Biennial Conference on Carbon, State College, PA, July 13-18.
16. Howard, B.H., **Lizzio, A.A.**, Chang, A.M., **Cal, M.P.** (1997) "Activated Char from Illinois Coal for VOC Control," 23rd Biennial Conference on Carbon, State College, PA, July 13-18.
17. **Cal, M.P.** (1997) "Nonideal Multicomponent Adsorption of VOCs on Activated Carbon," AIChE Spring National Meeting, Houston, TX, March 9-13.
18. **Cal, M.P.**, Dimotakis, E.D., Economy, J., Rood, M.J., Larson, S.M. (1996) "The Effect of Chemical Modification of Activated Carbon Cloth on the Adsorption of Organics and Water Vapor," 211th ACS National Meeting, Division of Fuel Chemistry, New Orleans, LA, March 24-28, 5 pp.
19. **Cal, M.P.**, Rood, M.J., Larson, S.M. (1995) "Removal of VOCs from Humidified Gas Streams Using Activated Carbon Cloth," AIChE Spring National Meeting, Houston, TX, March 19-23.
20. **Rood, M.J.**, Foster, K., **Cal, M.P.**, Graf, O., Larson, S.M., Economy, J. (1993) "Adsorption Properties of Activated Carbon Fibers: Applications to Indoor Air Quality," Indoor Air '93, 6th Annual Conference on Indoor Air Quality and Climate, July 4-8, Helsinki, Finland, Paper 1034/21328, 6 pp.
21. **Rood, M.J.**, **Cal, M.P.**, Foster, K., Graf, O., Gurgas, M., Larson, S., and Economy, J. (1993) "Adsorption Properties of Activated Carbon Fibers: Applications to Indoor Air Quality," November, Chungli, Taiwan.
22. **Rood, M.J.**, **Cal, M.P.**, Foster, K., Graf, O., Larson, S., and Economy, J. (1993) "Adsorption Capacities and Breakthrough Times for Volatile Organic Compounds Adsorbing onto Activated Carbon Fibers: Applications to Indoor Air Quality," Illinois Institute of Technology, February, Chicago, IL
23. **Cal, M.P.**, Rood, M.J., Larson, S.M. (1992) "Experimental and Modeled Results Describing the Adsorption of Acetone and Benzene onto Activated Carbon Fibers," Annual American Institute of Chemical Engineers Meeting, November 1-6, Miami Beach, Florida, Paper 210b, 15 pp.

24. Rood, M.J., **Cal, M.P.**, Foster, K., Fuerman, R., Graf, O., Larson, S., Economy, J. (1992) "Characterization of the Adsorption of Organic Compounds onto Microporous Activated Carbon Fibers," University of Goteborg, Department of Physics, July 27, Goteborg, Sweden.
25. **Cal, M.P.**, Larson, S.M., Rood, M.J. (1992) "Theoretical and Experimental Results Describing the Adsorption of VOCs onto Activated Carbon Fibers," 85th Annual Meeting of the Air and Waste Management Association, June, Kansas City, Missouri, Paper 92.79-11, 11 pp.
26. Fuerman, R.G., **Cal, M.P.**, Larson, S.M., Rood, M.J. (1991) "Removal of Gaseous Organic Contaminants from Indoor Air with Activated Carbon Fibers," poster presented at the 10th Annual Meeting of the American Association for Aerosol Research, October, Traverse City, Michigan.
27. Fuerman, R.G., **Cal, M.P.**, Larson, S.M., Rood, M.J. (1991) "Removal of Gaseous Organic Contaminants from Indoor Air with Activated Carbon Fibers," 84th Annual Meeting of the Air and Waste Management Association, June, Vancouver, British Columbia, Canada, Paper 91-62.5, 11 pp.

REPORTS

1. **Cal, M.P.** , Richardson, C.P., Gallegos, J.B., Bulut, G.G., Ealey, J., (2013) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Final Report (5/10/2013), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 163 pp.
2. **Cal, M.P.** , Richardson, C.P., Ealey, J., (2013) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (1/25/2013), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 18 pp.
3. Richardson, C.P., **Cal, M.P.** , Ealey, J., (2012) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (9/30/2012), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 15 pp.
4. Richardson, C.P., **Cal, M.P.** , Gallegos, J.B., (2012) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (6/30/2012), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 13 pp.
5. Richardson, C.P., **Cal, M.P.** , Gallegos, J.B., Bulut, G.G., (2012) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (3/30/2012), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 15 pp.
6. Richardson, C.P., **Cal, M.P.** , Gallegos, J.B., Bulut, G.G., (2011) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (12/30/2011), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 17 pp.
7. Richardson, C.P., **Cal, M.P.** , Gallegos, J.B., Bulut, G.G., (2011) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (9/30/2011), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 23 pp.
8. **Cal, M.P.** , Richardson, C.P., Gallegos, J.B., Bulut, G.G. (2011) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (6/30/2011), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 25 pp.
9. Richardson, C.P., **Cal, M.P.** , Gallegos, J.B., Bulut, G.G., (2011) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (3/31/2011), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 41 pp.
10. Richardson, C.P., **Cal, M.P.** , Gallegos, J.B., Bulut, G.G., (2010) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (12/30/2010), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 43 pp.
11. Richardson, C.P., **Cal, M.P.** , Gallegos, J.B., Bulut, G.G., (2010) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (9/30/2010), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 58 pp.

12. **Cal, M.P.**, Richardson, C.P., Gallegos, J.B., Bulut, G.G., (2010) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (6/30/2010), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 49 pp.
13. **Cal, M.P.**, (2010) "New Mexico Tech, Civil Engineering Program, ABET EAC Self-Study," 251 pp.
14. **Cal, M.P.**, (2010) "New Mexico Tech, Environmental Engineering Program, ABET EAC Self-Study," 238 pp.
15. **Cal, M.P.** (2010) "Las Cruces Airport (LRU) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 30 pp.
16. **Cal, M.P.** (2010) "Roswell Airport (ROW) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 35 pp.
17. **Cal, M.P.** (2010) "Deming Airport (DMN) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 30 pp.
18. **Cal, M.P.** (2010) "Raton Airport (RTN) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 28 pp.
19. **Cal, M.P.** (2010) "Sierra Blanca Ruidoso Airport (SRR) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 26 pp.
20. **Cal, M.P.** (2010) "Silver City Grant County Airport (SVC) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 26 pp.
21. **Cal, M.P.** (2010) "Belen Alexander Municipal Airport (E80) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 26 pp.
22. **Cal, M.P.** (2010) "Moriarty Municipal Airport (0E0) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 27 pp.
23. **Cal, M.P.** (2010) "Clayton Municipal Airport (CAO) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 25 pp.
24. **Cal, M.P.** (2010) "Double Eagle II (AEG) Pavement Condition and Analysis," New Mexico Department of Transportation-Aviation Division, 24 pp.
25. **Cal, M.P.**, Richardson, C.P., Bulut, G.G., Gallegos, J.B. (2010) "Development of Watercourse Aggradation/Degradation Risk Index for New Mexico", Quarterly Report (3/31/2010), Project NM10DSN-01, New Mexico Department of Transportation (NMDOT)-Research Bureau, 47 pp.
26. **Cal, M.P.** (2009) "Pavement Management System for New Mexico Airports," A Micropaver Database of Pavement Conditions at 49 New Mexico Airports, New Mexico Department of Transportation (NMDOT)-Aviation Division.
27. **Cal, M.P.**, (2008) "New Mexico Tech, Civil Engineering Program, ABET EAC Self-Study," 201 pp.
28. McDaniel, H., **Cal, M.P.** (2007) "Design of a Roadway and Culvert Drainage System for EMRTC 3K North Arroyo Causeway," Energetic Materials Research and Testing Center (EMRTC).
29. McMullin, P.M., Lee, C.M., **Cal, M.P.** (2007) "Design of a Retaining Wall System for the TSWG Subway Tunnel Construction," Energetic Materials Research and Testing Center (EMRTC).
30. Anton, N., **Cal, M.P.** (2005) "Adsorption of Perchlorate on Granular Activated Carbon Media," Sandia National Laboratories, 131 pp.
31. **Cal, M.P.**, (2004) "New Mexico Tech, Environmental Engineering Program, ABET Self-Study," 155 pp.
32. **Cal, M.P.** (1999) "Destruction of Volatile Organic Compounds Using Non-Thermal Plasmas," Waste-Management Education and Research Consortium (WERC).

33. **Cal, M.P.**, Strickler, B., Lizzio, A.A., Lytle, J.M. (1997) "Development of Novel Sorbents for Hot Gas Cleanup," Final Technical Report to the Illinois Clean Coal Institute.
34. **Cal, M.P.**, Slota, K.J., Lizzio, A.A. (1997) "Development of Carbon Molecular Sieves for Oxygen Recovery from Air," Final Technical Report to the Illinois Clean Coal Institute.
35. Lizzio, A.A., **Cal, M.P.**, Debarr, J.A., Donnals, G.L., Lytle, J.M., Haslbeck, J.L., Chang, A.M. (1996) "Development of Activated Char for Combined SO₂/NO_x Removal," Final Technical Report to the Illinois Clean Coal Institute.
36. Lizzio, A.A., **Cal, M.P.**, Lytle, J.M., Demir, I., Debarr, J.A., Donnals, G.L. (1996) "Methods to Evaluate and Improve the Gasification Behavior of Illinois Coal," Final Technical Report to the Illinois Clean Coal Institute.
37. Watson, J.G., Chow, J.C., **Cal, M.P.**, Diaz, S., Divita, F., Lowenthal, D., and Rogers, C.F. (1995) "PM₁₀ and PM_{2.5} Variations in Time and Space," Report to TRC Environmental Corporation, DRI Document No. 4204.1F.
38. Chow, J.C., Watson, J.G., **Cal, M.P.**, Divita, F., Lowenthal, D. (1995) "Imperial Valley/Mexicali Cross Border PM₁₀ Transport Study," Final Report to U.S. Environmental Protection Agency, Region IX, DRI Document No. 8623.2D1.
39. Watson, J.G., Blumenthal, D., Chow, J.C., Gillies, J.A., Divita, F., **Cal, M.P.**, Freeman, D. (1995) "Mt. Zirkel Wilderness Area Reasonable Attribution Study of Visibility Impairment," Technical Study Plan to Colorado Department of Public Health and Environment, Air Pollution Control Division.
40. **Cal, M.P.**, Larson, S.M., Rood, M.J., Graf, O., Foster, K., Dimotakis, E., Economy, J. (1994) "Adsorption of Indoor Organic Gases onto Activated Carbon Fibers," Final Technical Report to the Center for Indoor Air Research, 95 pp.
41. Larson, S.M., Rood, M.J., **Cal, M.P.**, Foster, K., Graf, O. (1993) "Adsorption of Indoor Organic Gases onto Activated Carbon Fibers," Second year report to Center for Indoor Air Research.
42. Rood, M.J. and **Cal, M.P.** (1992) "Review and Compilation of Information Pertaining to Asbestos Fibers in Indoor Environments," Report prepared for Segal McCambridge Singer & Mahoney, Ltd., Attorneys at Law.
43. Larson, S.M., Rood, M.J., **Cal, M.P.**, Foster, K. (1992) "Adsorption of Indoor Organic Gases onto Activated Carbon Fibers," First year report to Center for Indoor Air Research.
44. Rostam-Abadi, M., Chen, W.T., Harvey, R.D., **Cal, M.P.** (1989) "Sorbent Evaluation for Pressurized Fluidized-Bed Combustion," Final Technical Report to Center for Research of Sulfur in Coal.

Appendix B – Cases within the last 5-years where Dr. Cal has testified as an expert at trial or by deposition.

Cases within the last 5-years where Dr. Cal has testified as an expert at trial or by deposition.

1. Theresa Ford and Rhonda Leeson (Plaintiffs) vs. P.H. Glatfelter Company (Defendant) (2017), Case 2016-cv-00278-MHW-TPK, In the United States District Court for the Southern District of Ohio Eastern District. Testified in deposition regarding modeling nuisance level odor emissions from the Chillicothe Paper Mill facility located in Chillicothe, OH.
2. Ricky Gonzalez, et al. (Plaintiffs) vs. Clark-Floyd Landfill, LLC. (Defendant) (2018), In the Clark County Circuit Court Civil Division, Case 10C02-1608-CT-000131. Testified in deposition regarding modeling nuisance level odor emissions from the Clark-Floyd Landfill located in Borden, IN.
3. Andrea Hamilton, on behalf of herself and all others similar situated (Plaintiff) vs. 3D Idapro Solutions, LLC (Defendant) (2019), United States District Court of Wisconsin, Case No. 3:18-cv-0054-jdp. Testified in deposition regarding the modeling of nuisance level odor emissions from 3D Idapro Solutions located in Wisconsin Rapids, WI.
4. A Mini-Storage, LLC (Plaintiff) vs. Strategic Materials, Inc., Case 2019-CV-000633 in the State of Wisconsin Circuit Court, Walworth County (2020). Testified in deposition regarding nuisance level odor emissions from Strategic Materials located in Delavan, WI.

Appendix C – Fee Schedule

**Dr. Mark P. Cal, P.E., BCEE Schedule of Fees
2021 – Effective July 1, 2021**

Engineering Consulting, Design and Training

Dr. Mark P. Cal, rate \$180/hr

Expert Witness in Courtroom, Legal Deposition or Legal Testimony Review

Dr. Mark P. Cal, rate \$275/hr

Travel

Dr. Mark P. Cal, rate \$75/hr + travel and per diem expenses at current Federal rate
